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SOME ASPECTS OF INTRAPOPULATION RELATIONSHIPS IN THE OECONOMUS VOLE (Microtus oeconomus)

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The ecology of the oeconomus vole (Microtus oeconomus Pall.) has been relatively well studied, particularly the spatial relations of the population. At the same time the interrelations of animals in the population under natural conditions remain poorly understood. It is assumed that reactions to "aliens" during encounters differ in behaviour with those of familiar neighbours in the genus Microtus (Krebs 1970). To test this hypothesis in the field by first-hand observations of voles is practically impossible due to the way of life of these animals. We applied the "planting" of pairs of animals taken out of a natural population on a neutral territory (i.e. unfamiliar to both animals) and attempted to reveal the difference in behaviour of the voles living in one territory (from one intrapopulation group) and of animals spatially separated (from a different group).

The work was conducted in the summer of 1971 in the natural focus of leptospirosis in the Nero Lake Hollow (Yaroslav region). The number of oeconomus voles in the study area was extremely low, but we detected three groups of animals at relatively high density (up to 10-20 animals per hectare). These groups were located not less than 1.5-2 kilometres apart, and animals did not contact one another, based on the data from marked animals. A 1 hectare marking plot was set up on one of these areas, while in the other two areas live traps were placed at 10-15 metre intervals in a line along the shore of the lake. Captured animals were transported to the laboratory and were used in the experiments the same day.

Experiments consisted of the recording of different forms of behaviour in the animals (Krebs 1970; Getz 1962 and others). Voles were placed in a plastic arena with an area of 42 x 42 cm. The bottom of the arena was covered with sand which was changed after each experiment. A partition was placed in the arena before starting the experiment, dividing it into two parts. Voles were singly placed in the compartments, the partition was raised after about a minute, and detailed recordings of the behaviour of the experimental animals were begun. Ten minute experiments were divided into two minute intervals, during which all forms of behaviour of the voles were recorded with the help of conventional keywords. In order that animals would be easily distinguished, various parts of the fur on the body were clipped off.

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Two series of experiments were conducted:

1) "planting" of voles, living in one territory (familiar with each other)

2) encounters of individuals from spatially separated groups (unfamiliar)

Only adult, mature males were used in both cases and we tried to pick pairs of matching weight. In series 1 (familiar), we took animals from the marked grid and occasionally from the other plots (given the condition that they were caught on the same day at a distance of no more than 30 metres from each other). In series 2 (unfamiliar), pairs consisted of animals caught on different hollow plots. "Plantings" were conducted 1-2 hours before sunset (the normal time of high activity for the voles). A total of 16 experiments were conducted in series 1 with 20 animals, and 20 experiments in series 2 with 26 animals. Each vole participated in the experiments no more than two (rarely three) times in the course of the summer. Furthermore, we conducted about 20 preliminary experiments for the detailed description of the behaviour of adult male oeconomus voles. We divided the most characteristic forms of behaviour into three groups.

A. NEUTRAL CONTACTS ("SNIFFING")

NASO-NASAL CONTACT- mutual sniffing in the nose to nose position. NASO-ANAL CONTACT- head of one vole near anal-genital region of opponent.

B. AMICABLE CONTACTS

In this category we included those behaviours which took place during prolonged contact when no conflict resulted (Barnett, Evans 1965). We isolated 3 forms of behaviour. MUTUAL GROOMING- one animal runs paws and teeth through fur of opponent, licks its ears, genitals. HUDDLING- animals sit together, closely pressing against each other. FOLLOWING- one vole moves immediately after the other, almost touching the anal-genital region of the opponent with the snout.

C. AGGRESSIVE CONTACTS

I. ASSAULT: ATTACK (often accompanied by bites) and chase.

II. DEFENSE: COUNTERATTACK- defending animal rushes opponent and chases it; LUNGE- reciprocal actions of the defending animal (the vole not moving in the arena).

We observed various postures in the aggressive case, often accompanied by vocalizations (squeaking of the teeth) which were interpreted as an "external expression of excitement" (Johst 1967). (?displacement activity?) To these postures belong the "HUNCHED POSTURE"- body of the vole bent, fur erect; LIFTING THE TAIL- tail elevates above the ground and bends upwards.

Particularly we separated: CROUCHING- specific posture

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taken by the vole given an approaching opponent- animal lies on the ground, paws are held under the body, eyes are closed. This is possibly a submissive posture in the oeconomus vole. AVOIDANCE- active avoidance of contact with the opponent without aggressive action by both voles.

Analysis of the obtained material showed that neutral contacts prevailed in paired encounters of voles (mutual sniffing). The proportion of neutral contacts was practically identical in the behaviour of "familiar" and "unfamiliar" animals (61.4 and 60% respectively).

The correlations of aggressive and "amicable" behaviour substantially differed and depended on whether the opponent belonged to one intrapopulation group or to a different one. In the behaviour of familiar voles, amicable relations evidently prevailed over aggressive ones, but aggressive contacts by far composed the larger part of "unfamiliar" experiments (see Figure). The given data are statistically significant. It turned out that voles from the "familiar" experiments reliably showed more contacts of all the related forms (grooming, huddling, following). In the case of the "unfamiliar" voles strongly mutually aggressive encounters were characteristic, accompanied by the assumption of postures and actions which were rare in different situations. The hunched posture, lifting the tail and squeaking of the teeth, which we considered an "external expresion of excitement", were of this form.

It is also interesting to note that "familiar" voles more often "crouched" with a proximate opponent, but "unfamiliar" voles in this situation avoided contacts (these differences however were not statistically significant). Another peculiarity was the general speed of encounter in both cases. Generally, the voles began from the very start of the experiment to actively investigate the surroundings and sniffed each other. On the average, in the first two minutes of the experiment, the largest number of naso-nasal contacts was recorded in both the familiar and unfamiliar animals. The first sniffing always appeared as naso-nasal contact, however the first 1-3 naso-anal contacts always were longer than later ones. In the aggressive encounters, the number of sniffings decreases in the course of the experiment; in familiar voles the quantity of naso-nasal and nasal-anal contacts remained constant. "Amicable" or aggressive relations began to be displayed after the first few sniffings. "Amicable" contacts develop in the "familiar" voles after the first minutes of the experiment and then their number remains relatively constant in the rest of the meetings. In "unfamiliar" voles few aggressive actions occurred in the beginning of the experiment, the number of hostile contacts increased towards the middle of the encounters, and decreased again towards the end. Characteristic actions of aggressive encounters, which we related to "external expression of excitement", typically appeared after the 3-4 minute mark in the experiment. Generally, a few aggressive skirmishes preceeded its appearance.

Thus, under the experimental conditions (secluded area),

amicable behaviour prevailed among animals treated as one intrapopulation group, while aggressive behaviour prevailed in animals from spatially separated groups.

Similar data was obtained in experiments on the cotton rat (Sigmodon hispidus). Animals caught on a small plot and animals caught at distances of a few kilometres were placed in open air cages under natural conditions. Experiments showed that the number of skirmishes between "aliens" was statistically larger than between animals inhabiting one plot (Wolfe and Summerlin, 1968). Aggressive relationships between residents and aliens have also been described for other species of rodents (Andrzejewski et al., 1963; Rowe and Redfern, 1969; Getz, 1962; and others).

One can hypothesize that settlements of the oeconomus vole (at least in years of low numbers) are not random territorial accumulations of rodents, but represent a system of social relations between individuals. In each such group populating a territory, aggression between animals is suppressed. Apparently, the oeconomus vole is capable of identifying "familiar" individuals of its species and aggressively reacts to aliens. The expediency of this reaction is shown by other species of rodents (in artificial populations) and probably consists of the protection of territory and the maintenance of the prevailing system of relationships within the group.

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